Institutions and the Economic Development of Africa

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Abstract:

This paper explores the effect of institutions on the economic development of African countries in 2013. Previous studies showed opposing results in the past periods, some emphasizing the role of geography, others underlining the effects of institutions or policies. According to the analysis conducted in this paper using data on 48 countries, institutions can be considered a powerful factor explaining differences in development, while geography isn't significant. The roles of physical infrastructure and human capital are also essential.

Keywords: Africa, economic development, institutions, geography, infrastructure, human capital, institutional economics, econometric analysis

I. Introduction

In 2015 the economic situation in Africa appears to be degraded as seen from the mainstream Western media. For instance the New York Times released an article entitled “Ebola ravages economies in West Africa” (Gettleman, 2014). Parts of the continent are still struggling with epidemics, war or terrorism. But is the media coverage really reflecting the reality of the situation?

For long Africa was seen as a lost cause for economic development, with GDP per capita increasing only slightly for decades. Neoclassical models such as the Solow Model proved inefficient in predicting the evolution of African economies. However, this situation may be changing as Africa is emerging as important economic powerhouse. Africa currently enjoys high GDP growth rates, especially in East Africa (The Economist & IMF, 2014). The population of the continent tripled (UN, 2012) since the independences and it creates major concerns for economic development, with the risk of a Malthusian trap.

Most African countries remain low-income countries with relatively low exposure to globalization. They have to cope with major issues impeding their economic development. But World Bank experts expect most African countries to become middle-income nations in a matter of decades (World Bank, 2014). This relative take-off of the African economies is unevenly distributed, with countries booming and others still lagging behind. This is the opportunity to make an updated empirical study on a long-standing debate in economics: the role of institutions versus other factors, notably geography. Does this debate still make sense in the current context?

Institutions are a concept widely used in economics to analyze the development of African economies. Indeed, the particular growth pattern of African countries might be caused by the role of institutions. Moreover, as said previously, Africa will be a key contributor to world growth during this century, therefore it is a vital necessity to understand the origins of the economic development and disparities there. Adequate actions could then be taken to improve the economic situation in Africa.

For this paper, we will test the hypothesis that the differences in GDP per capita of African countries in 2013 can be explained for a large share by differences in institutions, rather than by geographical features. The rationale behind this is that good institutions promote growth by creating a climate needed for business and capital (human, physical, financial) development, notably with the rule of law and political stability.

II. Literature Review

"Institutions rule" (Rodrik)

The economic community is studying the economic development of African countries since the independences, that is to say the late 50s – early 60s. Economists struggled to understand why Africa didn't take off and catch up with more advanced economies. Indeed, the Solow Model (Solow, 1956) predicts convergence of developing economies through the accumulation of capital, and it didn't happen for Africa. The standard neoclassical Solow Model of economic convergence therefore seemed to be unable to predict African patterns, so it pushed economists to claim an African specificity for economic development. Attempts have therefore been made to augment the Solow Model in order to describe African patterns adequately (Anke E. Hoeffler, 2002). From the beginning of these studies, institutions were a major concern. The core of the debate is the opposition between institutions and geography, to determine the most prevalent factor on the economic growth and development. However, institutions have also been criticized as a cultural bias of the Northern countries to support their model of societal organizations (Council for the Development of Social Science Research in Africa, 2006). This has been used to conduct "one-size-fits-all" policies and reforms in African countries, notably with the support of international organizations such as the IMF or the World Bank.

- **Institutions as the key factor for understanding economic performance (Robinson, James, Daron Acemoglu, and Simon Johnson. "Institutions as a Fundamental Cause of Long-Run Growth.")**

In the traditional neo-classical growth models, cross-country differences in factor accumulation are due either to differences in saving rates (Solow), preferences (Cass–Koopmans), or other exogenous parameters. Although the first wave (Romer (1986) and Lucas (1988) and the second wave (Romer (1990), Grossman and Helpman (1991) and Aghion and Howitt (1992)), endogenized steady state growth and technical progress, variations in growth and income aren't explained by institutions. Acemoglu (2005) tries to address three questions in his paper. Firstly he reviews the evidence that institutions lead to growth. Then he wants to understand why institutions vary across countries and finally to highlight areas of improvement. Economic institutions determine the constraints and the

incentives of key actors in the economic sphere. They influence the structure of economic incentives in society (eg: property rights incentivize people to invest in human or physical capital), help to allocate resources to their most efficient uses and they determine who gets profits, revenues and residual rights of control. So according to Acemoglu (2005) if political institutions can allocate power to groups that encourage property rights enforcement, create constraints on power holders and capture a few rents by power holders, economic growth is simulated. Acemoglu (2005) also tries to compare the impact of geography, economic institutions and culture on the economic growth of a country. Based on two case studies (Korea partition and colonization), he concludes that institutions are the most important criteria for growth.

- **The empirical effects of institutions on the economy (Rodrik, Dani, Arvind Subramanian, and Francesco Trebbi. Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development.)**

Rodrik (2002) tries to compares the impact of institutions, geography and integration on economic development. Integration here refers to openness of a country to trade. What makes his study unique is his large sample size of 127 countries which is much greater than the previous sample used by Acemoglu (2001). Also he separates openness to trade from general governmental policies and tries to measure their impact separately. There are two separate opinions for impact of integration. The "Moderate view" supports that once certain institutions are in place, trade can foster convergence. The "Maximal view" regards integration as a major factor in the growth of poor countries. Rodrik (2002) includes several variables in his work: Institutions (property rights and rule of law), integration (% of GDP by trade) and Geography (Distance from equator in degrees). The quality of institutions has the greatest direct effect on income (always enters with the correct sign and is statistically significant) Controlling for institutions, integration has no direct effect on income, at times entering the regression with a negative sign, and geography has a weak direct effect on income. The quality of institutions positively and significantly effects integration. Geography also significantly affects the quality of institutions and thus, indirectly income. Rodrik (2002) is finally asking questions about the guidance provided by these results and the risks of a one-size-fits-all policy for institutions.

- **Institutions: the challenge of measurement (Voigt, Stefan. "How (Not) to Measure Institutions.")**

Voigt (2009) gives an overview of the difficulty to measure institutions. Indeed, the definition of institutions is by nature blurry, as they are often described as "the rules of the game". It means implicit constraints, formal rules and enforcement mechanisms (North, 1990). Institutions can be split in different categories, depending on their origin and enforcement mechanism. Glaeser (2004) criticized the previous papers on institutions, claiming that they were in fact measuring policies and not institutions. Indeed institutions are stable and therefore difficult to measure, unlike policies. Voigt (2009) then calls for indicators that focus on particular institutions and objective data, instead of surveys and broad concepts. It would allow the analysis of the effects linked to a particular institution *per se*. Unfortunately this kind of data is particularly difficult to obtain, especially for Africa. So most econometric works must rely on subjective and aggregate indicators of institutions. Also, the datasets recommended by Voigt, for instance from the "Quality of Governance Institute at the University of Gothenburg" (Sweden)**,** often include indicators based on the methods he criticizes.

- **Institutions and Africa: a vibrant econometric topic (Naudé, W. A. "The Effects of Policy, Institutions and Geography on Economic Growth in Africa: An Econometric Study Based on Cross-Section and Panel Data.")**

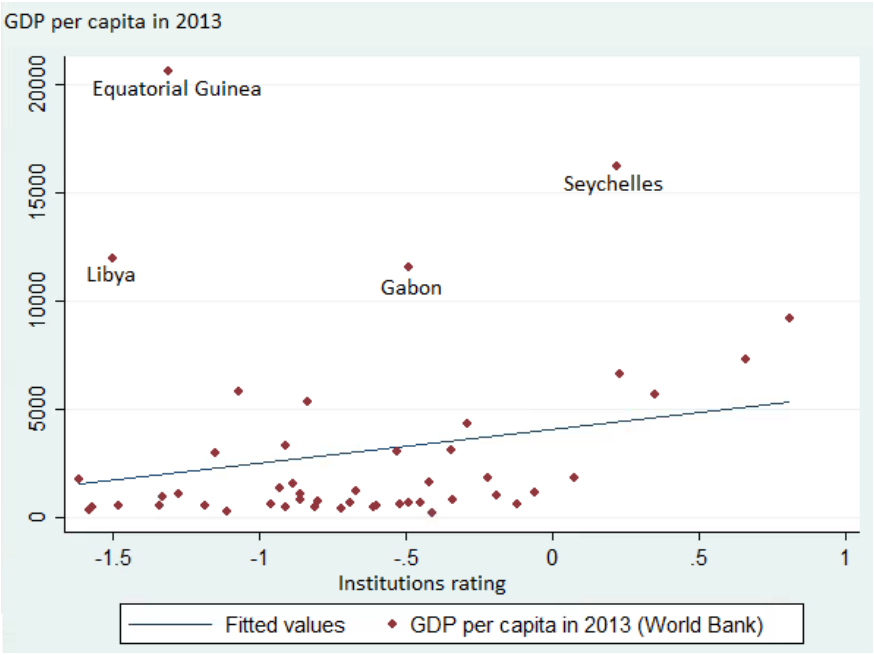
Naude (2004) provides us a relatively recent econometric analysis on the determinants of growth and economic development in Africa. However, it is based on quite old historical data (1970-1990). It supported the importance of institutions to explain the differences in economic status and confirmed the theory of a conditional convergence. It is also comparing different methods of econometric analysis. Various factors are discussed to rightfully conduct an econometric analysis for African development: geography (landlockness, malaria…), policies (black market, openness to trade…), and institutions (corruption…). The choice of the mathematical method (OLS, LAD, and GMM) is found to greatly affect the results of the studies. Studying growth instead of stock is also a source of underestimation of geography. Finally, Naude (2004) concludes that policies explain most of the variations, but also supports an intense link between institutions, geography and policies.

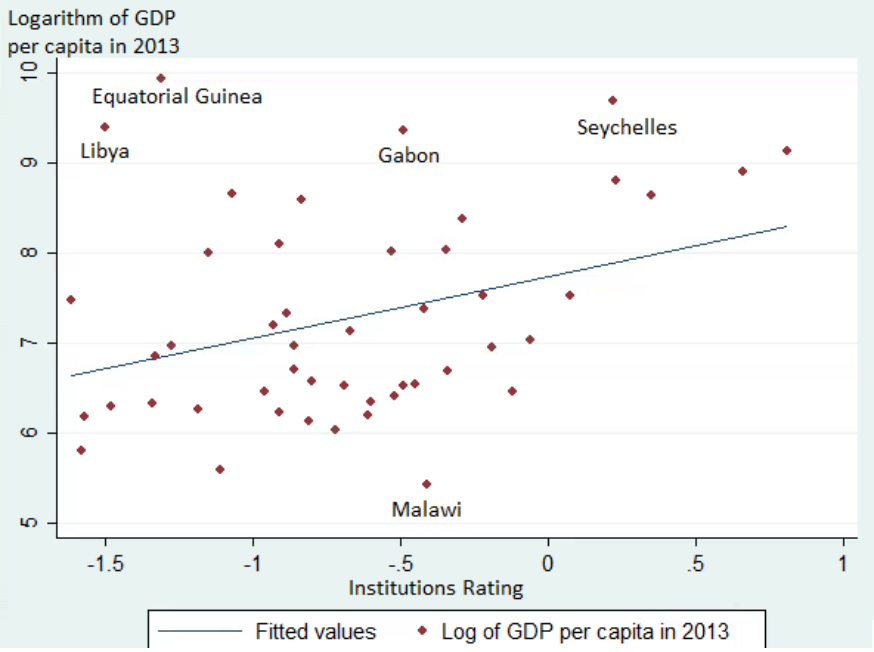
The contribution of this paper to the literature will be composed of two parts. First, the use of updated data to conduct an econometric analysis for the share of institutions in African economic development. Then, it will also aggregate the institutions as a single entity, using the newest indicators available. Data used was mainly collected for 2013.

III. Data and Modeling

We chose to study the level of GDP per capita in 2013 as an indicator of economic development. Indeed, it seems to be the best option for our trade-offs. First, it offers a good compromise between availability of data and analysis of recent trends. Then, GDP per capita allows us to compare countries with different populations, as the nominal GDP would differ significantly across countries and wouldn't reflect reality. Finally, studying GDP/capita and not the growth rate of it allows us not to overestimate the effects of institutions and underestimate geography (Naude, 2004). To allow dynamic analysis with percentages, we chose to study the log of this GDP per capita. Of course, this indicator also has limits: we will not get any information about wealth distribution or quality of life (health, education etc). For instance, the GDP per capita of Equatorial Guinea is high ($20,581.6 in 2013 according to the World Bank) but the wealth extracted from petroleum doesn't benefit the entire population.

For our model, we will use the log of this GDP per capita, because the relationships shown by graphs support this choice (outliers). Also, it will also us to interpret the results in percentages.





As we focus on Africa, the sample is fixed and relatively small. There are currently 54 independent countries on the continent, including island nations such as Sao Tome. We excluded non-independent entities because they don't face the same challenges as African countries, for instance the overseas *département* of France (Mayotte) benefits from financial transfers from mainland France. Also, the disputed territories are excluded, because of the lack of reliable data, for example the Western Sahara territory. Also, some States (Cabo Verde, Djibouti, Liberia, Republic of Congo, Somalia and South Sudan) are lacking several measurements because of internal turmoil or limits of scope of statistical studies. As a consequence, the sample size is reduced to 48, which leads to small sample size issues.

We also need a reliable definition of institutions. To keep it broad, we will take the definition of Kaufman (1999), describing them as "rules of the game". He distinguished 6 types of institutions: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. Each component is ranked on a scale from -2.5 to 2.5, with higher scores meaning better institutional quality. To test our hypothesis, we will first create a simple linear regression model, with only institutions as the independent variable. Then, in a multiple regression model, we will control for other relevant variables.

III.1. Simple Linear Regression

The most difficult task for this model was to find a reliable indicator for institutions. According to Stefan Voigt (2009), it is better to pick indicators that don't depend on subjective factors, such as surveys of corruption. However, such objectives indicators are not easily publicly available, so that's why we switched to survey-based indicators. However, these objective indicators will soon become available, for instance with the GI Index of Transparency International. The World Bank is providing indicators ranking institutions. The advantage of these indicators is that they follow the exact definition of Kaufmann (1999), as he is working on these indicators himself (WGI, 2014). They are defined on the same scale: -2.5 to +2.5, the higher the better the institutions are. So we can average them to get an overall institutional quality indicator. Indeed, in this paper we don't plan to measure the effects of a specific institution but rather them collectively, to compare their effects with other relevant factors.

So our simple linear regression model is:

$$log(gdppc) = \beta_0 + \beta_1 coinst + u$$

With *log(gdppc)*, the natural logarithm of the GDP per capita in 2013 (World Bank) and *coinst* the average of the Governance Indicators in 2013. (WGI). We obviously expect a positive correlation between *coinst* and *log*(*gdppc)*.

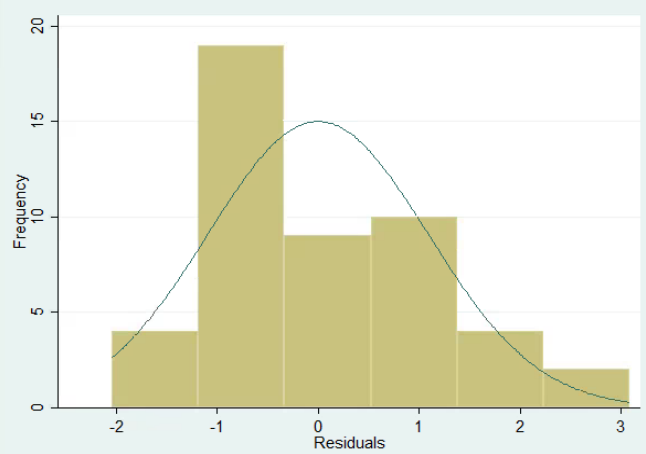
Basic statistics about the data of the simple model are summed up in the following table:

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Gdppc	48	3023.23	4348.15	226.5	20581.6
Log(Gdppc)	48	7.28	1.16	5.42	9.93
Coinst	48	-0.67	0.58	-1.62	0.81

Compliance with Gauss-Markov Assumptions:

- Linearity in parameters: trivial by looking at the equation and the estimators.
- Random Sampling: the methodology of the World Bank satisfies this assumption.
- Sample variation in the explanatory variable (*coinst*): it can be checked by looking at the descriptive table above and the appendix.

- Zero conditional mean: Dubious in this case as several important variables are omitted. The plotted graph shows skewness.



The sample residuals mean is -3.22×10^{-09}.

- Homoscedasticity: If we test using the Cameron & Trivedi's method:

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	1.59	2	0.4515
Skewness	8.89	1	0.0029
Kurtosis	0.36	1	0.5467
Total	10.85	4	0.0283

The p-value is greater than 0.05 for heteroskedasticity, so we cannot reject the Null Hypothesis. It means that there is significant (5%) evidence to support the fact that homoscedasticity is respected.

As we can see, this model is likely to meet all requirements of the Gauss-Markov Assumptions, with uncertainties on the zero conditional mean. Still, it will mainly be used for comparison with the MLR model.

III.2. Multiple Linear Regression

In order to enhance our model and to capture the real effects of institutions on economic development, several variables will be added. They are chosen in order to limit the omitted variables bias, but in a small number not to increase artificially the explanatory power of the model. As we have seen in the literature review, different kind of factors can explain economic development: institutions, geography, culture, human capital, policies and purely economic factors.

For the institutions, we will keep our indicator previously described in 4.1.

We chose to use language proficiency as an explanatory variable for economic development. Indeed, the linguistic unity – or disunity – of a country impacts its ability to generate wealth. Broader language diffusion helps to ease trade and to reduce social or ethnic tensions within a country. To build the indicator, we took the percentage of the population speaking the most widely spread language. The source for language proficiency is *Ethnologue*, a major reference in this field. Of course, the indicator suffers from collection error and difficulties with the definition of a "speaker", notably for Indo-European communication languages. Also separation between proper languages, dialects and mutually intelligible languages is blurry. However, we do expect a positive relationship between the maximum proportion of the population able to speak the same language and GDP per capita.

Another variable for the human capital is the level of instruction. To estimate this, we rely on the literacy rates, that is to say the share of the population able to read and write. Indeed, countries in Africa achieve very diverse levels of literacy rates so it is still an adequate indicator to judge the quality of an education system there. The source is the UNESCO (2013). We do expect a positive correlation between literacy rates and GDP per capita.

A variable is used to describe geography and its impact on economic development. We included a dummy variable for access to sea (1 if it has access to a coast, 0 if landlocked). The source is a standard map of Africa (see appendix) and by definition the error of this indicator is 0. The fact that a country is landlocked also has impacts on trade, disease and climate. So we do expect a positive relationship of access to water on the GDP per capita.

Another explanatory variable of the model is the reliance on natural resources. The indicator linked is the percentage of GDP generated by resources rent, that is to say the extraction of energetic resources

(oil, uranium) or minerals (diamonds, bauxite, coal…). The World Bank is providing data for this indicator, unfortunately the last data is from 2012. What is expected from this variable is unclear because resources rent can be a major source of wealth but also lead to the "resource curse" (Auty, 1990) phenomenon.

Policy quality is also a major variable to control to evaluate the differences in economic development. Obviously, policies are contextual and there is no absolute "good policy". However, it seems that openness to trade is a common indicator for quality of policies (Sachs, 1997). Indeed, it means the country has the capabilities to compete on the global market. World Bank published an indicator for that, with values available for 2013. As supported by various international trade theories (competitive advantage…), we expect a positive relationship between the level of the GDP per capita and the openness of the country to trade.

Another indicator to use as a control variable is the net inflow of FDI per capita in US dollars. Indeed, it will have a direct impact on the GDP per capita, as foreign firms favor local development and good practices in the economic sphere. It also captures the quality of policies enacted. The source is the World Bank (2013) as well.

Finally, to measure the quality of infrastructure, the rate of electrification is our last variable, that is to say the share of population with access to electricity. Indeed, electricity is needed to perform economic activities and to allow a decent quality of life for the population. It is also a reliable indicator. The World Energy Outlook is publishing them (WEO, 2014). We obviously expect a positive link between the electrification rate and the economic development.

Therefore, we can estimate the new multivariable model:

$$log(gdppc) = \beta_0 + \beta_1 coinst + \beta_2 lang + \beta_3 lit + \beta_4 sea + \beta_5 res + \beta_6 trade + \beta_7 fdipc + \beta_8 elec + u$$

With: *log(gdppc)* the natural logarithm of the GDP per capita in 2013, *coinst* the rating of institutions in 2013, *lang* the share of the population speaking the dominant language, *lit* the literacy rate, *sea* a dummy variable for access to the sea, *res* the share of exports linked to resource rent, *trade* the share of trade related to GDP, *fdipc* the net balance of FDI per capita and *elec* the electrification rate.

Basic statistics about the variables of the model are summed up in the following table:

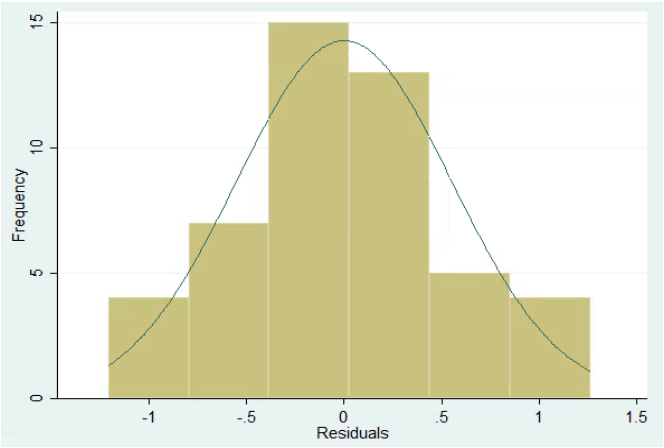
Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Gdppc	48	3023.23	4348.15	226.5	20581.6
Log(Gdppc)	48	7.28	1.16	5.42	9.93
Coinst	48	-0.67	0.58	-1.62	0.81
Lang	48	61.31	25.02	14	100
Lit	48	64.88	18.78	25.3	94.2
Sea	48	0.71	0.46	0	1
Res	48	15.23	14.29	0	55
Trade	48	65.34	29.53	25.5	142.5
Fdipc	48	$1.48x10^8$	$4.29x10^8$	$-3.31x10^8$	$2.39x10^9$
Elec	48	41.02	30.57	3	100

Compliance with Gauss-Markov Assumptions:

- Linearity in parameters: trivial here, as the model is written as stated previously
- Random sampling: granted by the data collection methods.
- No perfect collinearity: there is no linear relationship between two independent variables. The following correlation matrix between the explanatory variables supports this claim even if some correlation levels are quite high:

Correlation	**coinst**	**lang**	**lit**	**sea**	**res**	**trade**	**fdipc**	**elec**
coinst	1.0000							
lang	-0.0239	1.0000						
lit	0.2323	**0.4641**	1.0000					
sea	-0.0468	-0.1863	0.0842	1.0000				
res	**-0.4656**	-0.0097	0.0302	0.1011	1.0000			
trade	0.3482	0.2333	0.3150	0.0181	0.2344	1.0000		
fdipc	0.1020	0.2301	0.3666	0.1762	0.2394	**0.5017**	1.0000	
elec	0.3596	0.2367	**0.5568**	0.3989	-0.0134	0.2051	0.3247	1.0000

- Zero conditional mean: it seems that the regression includes enough different types of variables to ensure a zero conditional mean (institutions, geography, human capital, infrastructure and policy). However, there is not an excess of variables, so the quality of the regression would not be artificially risen. Plotting the residuals of the multiple variable regression, we can see that the zero conditional mean is greatly respected:



The sample mean of the residuals is -3.25×10^{-09}. The residuals also seem to follow a normal distribution.

- Homoscedasticity: very likely to be present, as shown in the following test:

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	43.76	43	0.4392
Skewness	8.94	8	0.3472
Kurtosis	0.03	1	0.8714
Total	52.73	52	0.4458

According to the Cameron & Trivedi's test, the p-value is very large, so we cannot reject the Null hypothesis of homoskedasticity. Therefore, homoscedasticity is likely to be a property of the model. It means that the estimators will have the smallest possible variance.

So our model fulfills all the Gauss-Markov Assumptions, ensuring unbiased estimators with the smallest possible variance.

IV. Results

IV.1. Simple Linear Regression Results

Predicted effect on log(gdppc)	
Independent Variables	**Coefficients**
Coinst	0.69*** (0.28)
Intercept	7.74*** (0.24)
Number of Observations	48
R^2	0.12

(2 decimal digits, see appendix for full results, with *** significance at 1%)

That is to say:

$$\widehat{\log(gdppc)} = \underset{(0.2444582)}{7.7428} + \underset{(0.6855355)}{0.6855355}coinst$$

This first regression shows a positive coefficient for *coinst* ($\beta_1 = 0.66855355$). Moreover, this coefficient is significant at the 5%, and even at the 1% confidence level. It means that an increase of 1 of the institutions rating is predicted to lead to a 68.55% increase of the GDP per capita. The impact of institutions is therefore large. The differences in institutions ratings are moreover quite large among African countries (more than 2 points). So this result has explanatory power in reality.

The intercept is not relevant to our analysis, as we mostly try to study the impact of differences in institutions, therefore cancelling out the intercept.

The R^2 is fairly high for a simple model, the regression explaining 11.70% of the variations observed.

IV.2. Multiple Linear Regression Results

(2 decimal digits, see appendix for full results)

Predicted effect on log(gdppc)	
Independent Variables	**Coefficients**
Coinst	**0.44*** **(0.24)**
Lang	**0.00094** **(0.0044)**
Lit	**0.013*** **(0.0064)**
Land	**0.13** **(0.23)**
Res	**0.023***** **(0.0083)**
Trade	**0.0015** **(0.0042)**
Fdipc	**$4.76x10^{-10}$*** **($2.56x10^{-10}$)**
Elec	**0.019***** **(0.0043)**
Intercept	**5.34** **(0.48)**
Number of Observations	**48**
R^2	**0.77**

(with * significance at 10%, ** significance at 5% and *** significance at 1%)

That is to say:

$$\widehat{\log(gdppc)} = \underset{(0.4674)}{5.342631} + \underset{(0.2360089)}{0.441865}coinst + \underset{(0.0044497)}{0.0009421}lang + \underset{(0.0063996)}{0.0126172}lit + \underset{(0.2331072)}{0.1297166}land$$

$$+\underset{(0.008334)}{0.0225724}res + \underset{(0.0041923)}{0.0014291}trade + \underset{(2.56\text{x}10^{-10})}{4.76\text{x}10^{-10}}fdipc + \underset{(0.0042816)}{0.0185636}elec$$

The R^2 is high with this regression (77.37%). It seems that the quality of institutions is the main factor to explain differences in economic development. It tends to confirm our research hypothesis. An increase of the institutions rating of 1 would lead to a 44.18% increase in GDP per capita. The institutions coefficient has the highest coefficient, however its significance level is only of 10%.

Resources seem to be an advantage rather than a "curse" for Africa, with a positive relationship (0.0225724) between share of GDP created by resource rent and the log of GDP per capita. So an increase of one percentage point of the share of resource rent in GDP is predicted to lead to a 2.25% increase in GDP per capita. Indeed, some countries are enjoying high level of development combined with a resource based economy, such as Botswana. Resource rent is very significant (1%).

Electrification, that is to say physical infrastructure, is also a leading determinant of economic prosperity. Indeed, the coefficient is high (0.0185636) with a relatively small variance (1% significance level). It means that a progress of one percentage point in electrification rate is predicted to generate a 1.85% increase in GDP per capita. It can be argued that electricity is so important because it is required to develop advanced economic activities, such as manufacturing, higher education…

Literacy is also found to have a significant positive effect (0.0.126172) on GDP per capita. Indeed an increase of one percentage point of the literacy rate is predicted to increase the GDP per capita by 1.26%. It is showing the virtuous effect of an educated population, even if the significance level is only of 10%.

Finally, the inflow of FDI per capita seems to have a positive effect on GDP, but to a very small extent ($4.76\text{x}10^{-10}$). To have a significant economic effect on the GDP per capita, the increase of FDI per capita must be massive.

Language unity, openness to trade and access to sea seem to have positive effects on GDP per capita, but they suffer from having 0 in their confidence interval. They are not statistically significant.

However, the literacy rates and the language unity are highly correlated and a joint effect could be justified by logic. So we can test for their joint significance. Using a restricted model, we can compute the F-Statistic thanks to the formula:

$$F = \frac{\frac{(R^2UR - R^2R)}{q}}{\frac{(1-R^2UR)}{(n-k-1)}}$$

The F test 2.37, however the critical value (with 2 and 39 degrees of freedom, 5%) is higher, at 3.23. As a consequence, we cannot conclude that they are jointly significant at 5%. Other possible joint significance tests (with a high enough correlation between variables) lack supportive theories to try them.

V. Conclusions

Our study tends to confirm the theory that institutions rule to explain the economic performance of African countries. Geography doesn't appear as an important factor in our regression. Perhaps it is because of the general progress of technology and institutions that reduces vulnerability to geographical features. Basic human capital development, like achieving high literacy rates, is also still important for the African economies. Finally, the physical capital is one of the key factors to improve the economies in Africa, for instance the electrification.

There are several ways to expand this study. The most obvious would be to convey an analysis on institutions at the global level, not only for Africa. It would allow us to learn if institutions are reaching a "saturation effect", in other terms if institutions are only important before a certain level of development. The question of differences of factors of economic development between developed and developing countries could therefore be uncovered. A deeper analysis about the different systems of institutions could also be conducted, for instance the property laws. Now that we know that institutions have a powerful effect on African countries' economies, we should also study the impact of individual institutions.

VI. Appendix

Data Tables

- **GDP per capita in 2013 (World Bank, constant US dollars)**

Country	Log(gdppc)	gdppc
Algeria	8.58685	5360.702
Angola	8.662747	5783.402
Benin	6.69047	804.7001
Botswana	8.897682	7314.999
Burkina Faso	6.527812	683.8999
Burundi	5.587623	267.1
Cameroon	7.191881	1328.6
Central African Republic	5.808743	333.2
Chad	6.960063	1053.7
Comoros	6.703188	814.9999
Côte d'Ivoire	7.332304	1528.9
DR Congo	6.182498	484.2
Egypt	8.106062	3314.5
Equatorial Guinea	9.932153	20581.6
Eritrea	6.298582	543.8
Ethiopia	6.224558	505
Gabon	9.356266	11571.1
Gambia	6.191544	488.5999
Ghana	7.527363	1858.2

Guinea	6.259773	523.1
Guinea-Bissau	6.3347	563.8
Kenya	7.127292	1245.5
Lesotho	7.026072	1125.6
Libya	9.389716	11964.7
Madagascar	6.137727	463.0001
Malawi	5.422745	226.5
Mali	6.572423	715.1001
Mauritania	6.974479	1069
Mauritius	9.127231	9202.502
Morocco	8.036767	3092.599
Mozambique	6.405229	605.0001
Namibia	8.64701	5693.098
Niger	6.029242	415.4001
Nigeria	8.0082	3005.501
Rwanda	6.459435	638.7001
Sao Tome and Principe	7.383865	1609.8
Senegal	6.953302	1046.6
Seychelles	9.691895	16185.9
Sierra Leone	6.520621	679.0001
South Africa	8.797533	6617.898
Sudan	7.469312	1753.4
Swaziland	8.017703	3034.2
Tanzania	6.543624	694.7999
Togo	6.455827	636.4
Tunisia	8.370247	4316.702

Uganda	6.349139	572.0001
Zambia	7.520126	1844.8
Zimbabwe	6.860034	953.3999

- **Institutions Quality in 2013 (World Bank, CPIA indicators)**

Country	Voice & Accountability	Stability & Violence	Gvt Effectiveness	Regulation Quality	Rule of Law	Corrupt° Control
Algeria	-0,89	-1,17	-0,6	-1,19	-0,68	-0,48
Angola	-1,12	-0,37	-1,26	-1,05	-1,28	-1,32
Benin	0,12	0,28	-0,55	-0,42	-0,63	-0,83
Botswana	0,47	1,06	0,28	0,66	0,59	0,92
Burkina Faso	-0,29	-0,75	-0,62	-0,17	-0,53	-0,58
Burundi	-0,97	-1,3	-1,07	-0,87	-1,06	-1,39
Cameroon	-1,04	-0,52	-0,86	-0,93	-1,05	-1,19
CAR	-1,53	-2,15	-1,78	-1,13	-1,83	-1,04
Chad	-1,38	-1,1	-1,5	-1,02	-1,37	-1,28
Comoros	-0,52	-0,24	-1,44	-1,26	-0,99	-0,73
Congo DR	-1,47	-2,23	-1,59	-1,28	-1,55	-1,3
Côte d'Ivoire	-0,77	-1,05	-1,04	-0,73	-0,93	-0,79
Egypt	-1,04	-1,62	-0,89	-0,7	-0,6	-0,6

Equatorial Guinea	-1,96	0,08	-1,59	-1,44	-1,32	-1,61
Eritrea	-2,15	-0,78	-1,54	-2,23	-1,39	-0,79
Ethiopia	-1,29	-1,39	-0,52	-1,13	-0,62	-0,5
Gabon	-0,86	0,34	-0,77	-0,56	-0,52	-0,56
Gambia	-1,25	-0,05	-0,72	-0,37	-0,59	-0,7
Ghana	0,41	0,02	-0,09	0,08	0,11	-0,07
Guinea	-1,06	-1,23	-1,32	-1,01	-1,42	-1,06
Guinea-Bissau	-1,41	-0,93	-1,44	-1,3	-1,62	-1,33
Kenya	-0,24	-1,15	-0,49	-0,35	-0,74	-1,06
Lesotho	0,08	0,33	-0,38	-0,35	-0,26	0,23
Libya	-1	-1,81	-1,5	-1,83	-1,36	-1,52
Madagascar	-0,78	-0,71	-1,12	-0,67	-0,9	-0,69
Malawi	-0,19	-0,22	-0,56	-0,68	-0,19	-0,64
Mali	-0,3	-1,69	-0,84	-0,5	-0,75	-0,73
Mauritania	-0,93	-1,02	-0,9	-0,7	-0,95	-0,68
Mauritius	0,89	0,94	0,88	0,94	0,9	0,3
Morocco	-0,72	-0,5	-0,07	-0,17	-0,25	-0,36
Mozambique	-0,29	-0,27	-0,65	-0,41	-0,85	-0,65
Namibia	0,39	0,93	0,19	0,05	0,25	0,3

Niger	-0,36	-1,3	-0,71	-0,61	-0,75	-0,57
Nigeria	-0,74	-2,08	-1,01	-0,71	-1,16	-1,2
Rwanda	-1,18	-0,08	0	0,03	-0,15	0,65
Sao Tome	0,11	0,12	-0,74	-0,81	-0,82	-0,38
Sénégal	0,03	-0,09	-0,48	-0,05	-0,27	-0,28
Seychelles	0,01	0,87	0,28	-0,29	0,04	0,39
Sierra Leone	-0,39	-0,15	-1,14	-0,69	-0,88	-0,9
South Africa	0,58	-0,06	0,43	0,41	0,13	-0,12
Sudan	-1,78	-2,2	-1,53	-1,44	-1,25	-1,49
Swaziland	-1,16	-0,44	-0,44	-0,36	-0,42	-0,34
Tanzania	-0,23	-0,15	-0,67	-0,34	-0,5	-0,82
Togo	-0,98	-0,43	-1,37	-0,95	-1,01	-1,04
Tunisia	-0,11	-0,91	0	-0,35	-0,2	-0,15
Uganda	-0,55	-0,84	-0,58	-0,24	-0,36	-1,05
Zambia	-0,11	0,39	-0,48	-0,41	-0,31	-0,39
Zimbabwe	-1,39	-0,69	-1,14	-1,8	-1,57	-1,37

Data: 2013 http://info.worldbank.org/governance/wgi/index.aspx#reports

- **Average of the previous 6 variables: coinst (scale: -2.5 to 2.5)**

Country	coinst
Algeria	-0.835
Angola	-1.067
Benin	-0.338
Botswana	0.66
Burkina Faso	-0.49
Burundi	-1.11
Cameroon	-0.93
Central African Republic	-1.58
Chad	-1.275
Comoros	-0.86
Côte d'Ivoire	-0.885
DR Congo	-1.57
Egypt	-0.91
Equatorial Guinea	-1.31
Eritrea	-1.48
Ethiopia	-0.91
Gabon	-0.49
Gambia	-0.61
Ghana	0.077
Guinea	-1.183

Guinea-Bissau	-1.34
Kenya	-0.67
Lesotho	-0.058
Libya	-1.5
Madagascar	-0.81
Malawi	-0.41
Mali	-0.8
Mauritania	-0.86
Mauritius	0.81
Morocco	-0.345
Mozambique	-0.52
Namibia	0.35
Niger	-0.72
Nigeria	-1.15
Rwanda	-0.12
Sao Tome and Principe	-0.42
Senegal	-0.19
Seychelles	0.22
Sierra Leone	-0.69
South Africa	0.23
Sudan	-1.615
Swaziland	-0.53
Tanzania	-0.45
Togo	-0.96

Tunisia	-0.29
Uganda	-0.6
Zambia	-0.22
Zimbabwe	-1.33

- **Language proficiency: Maximum share of the population speaking a single language (Ethnologue)**

Country	Max percentage of the population speaking a single language	Main Language	Economic Elite Language
Algeria	71	Arabic	French
Angola	60	Portuguese	Portuguese
Benin	14	Fon	French
Botswana	90	Tswana	English
Burkina Faso	45	Moore	French
Burundi	98	Rundi	French
Cameroon	60	French	French/English
Central African Republic	93	Sango	French
Chad	60	Arabic	French
Comoros	97	Comorian	French
Côte d'Ivoire	70	French	French
DR Congo	45	French	French
Egypt	68	Arabic	English
Equatorial Guinea	86	Spanish	Spanish/French

Eritrea	50	Tigrinya	Italian/English
Ethiopia	27	Amharic	Arabic/English
Gabon	80	French	French
Gambia	25	Mandinka	English/Arabic
Ghana	35	Akan	English
Guinea	25	French	French
Guinea-Bissau	60	Portuguese Creole	Portuguese/French
Kenya	19	Kikuyu/Swahili	English
Lesotho	82	Sotho	English
Libya	65	Arabic	Italian/Arabic
Madagascar	77	Malagasy	French
Malawi	44	Chichewa	English
Mali	93	Bamanankan	French
Mauritania	71	Hassaniyya	French/Arabic
Mauritius	90	Mauritian Creole	French/English
Morocco	60	Arabic	French
Mozambique	50	Portuguese	Portuguese
Namibia	49	Oshiwambo	English
Niger	50	Hausa	French
Nigeria	35	English	English
Rwanda	59	Rwanda	French/English
Sao Tome and Principe	100	Portuguese Creole	Portuguese

Senegal	31	Wolof	French
Seychelles	90	French Creole	French
Sierra Leone	82	English	English
South Africa	32	English	English/Afrikaans
Sudan	76	Arabic	English
Swaziland	80	Swati	English
Tanzania	32	Swahili	English
Togo	29	French	French
Tunisia	100	Arabic	French
Uganda	68	Swahili	English
Zambia	28	Bembe	English
Zimbabwe	92	Shona	English

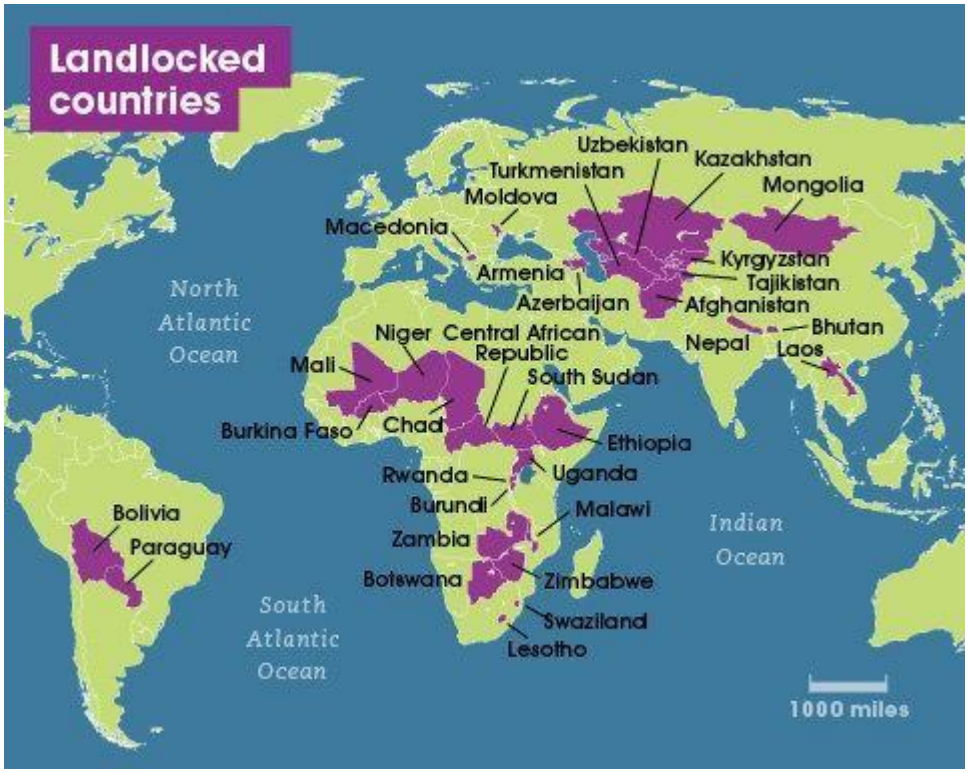
- **Literacy rate in 2013 (UNESCO)**

Country	**Literacy rate (%)**
Algeria	72.6
Angola	70.4
Benin	28.7
Botswana	85.1
Burkina Faso	28.7
Burundi	86.9
Cameroon	71.3
Central African Republic	56.6

Chad	35.4
Comoros	75.5
Côte d'Ivoire	56.9
DR Congo	61.2
Egypt	73.9
Equatorial Guinea	94.2
Eritrea	68.9
Ethiopia	39
Gabon	89
Gambia	51.1
Ghana	71.5
Guinea	25.3
Guinea-Bissau	55.3
Kenya	72.2
Lesotho	75.8
Libya	89.5
Madagascar	64.5
Malawi	61.3
Mali	33.4
Mauritania	58.6
Mauritius	88.8
Morocco	67.1
Mozambique	50.6
Namibia	76.5

Niger	28.7
Nigeria	51.1
Rwanda	65.9
Sao Tome and Principe	69.5
Senegal	49.7
Seychelles	91.8
Sierra Leone	43.3
South Africa	93
Sudan	71.9
Swaziland	87.8
Tanzania	67.8
Togo	60.4
Tunisia	79.1
Uganda	73.2
Zambia	61.4
Zimbabwe	83.6

- **Map of landlocked countries:**



Mali, Niger, Chad, Burkina Faso, Central African Republic, South Sudan, Ethiopia, Uganda, Rwanda, Burundi, Malawi, Zambia, Zimbabwe, Botswana, Swaziland and Lesotho. (UN)

- **Resource rent as share of GDP in 2013 (World Bank)**

Country	Resource rent (%)
Algeria	23
Angola	42
Benin	5
Botswana	4
Burkina Faso	22
Burundi	23

Cameroon	11
Central African Republic	8
Chad	30
Comoros	3
Côte d'Ivoire	9
DR Congo	33
Egypt	12
Equatorial Guinea	52
Eritrea	15
Ethiopia	13
Gabon	47
Gambia	5
Ghana	19
Guinea	30
Guinea-Bissau	18
Kenya	4
Lesotho	4
Libya	55
Madagascar	9
Malawi	10
Mali	16
Mauritania	52
Mauritius	0
Morocco	5

Mozambique	12
Namibia	2
Niger	9
Nigeria	17
Rwanda	6
Sao Tome and Principe	2
Senegal	5
Seychelles	0
Sierra Leone	9
South Africa	8
Sudan	8
Swaziland	1
Tanzania	12
Togo	9
Tunisia	7
Uganda	12
Zambia	23
Zimbabwe	10

- **Share of Trade compared to GDP in 2013 (World Bank)**

Country	**Trade as share of GDP (%)**
Algeria	57.1
Angola	75.1

Benin	47
Botswana	102.5
Burkina Faso	49.7
Burundi	33.6
Cameroon	37.9
Central African Republic	26
Chad	51.8
Comoros	50.8
Côte d'Ivoire	83.6
DR Congo	38.5
Egypt	31.9
Equatorial Guinea	138
Eritrea	39.5
Ethiopia	31.4
Gabon	69.3
Gambia	48.7
Ghana	65.1
Guinea	55.3
Guinea-Bissau	44.8
Kenya	40.2
Lesotho	130.5
Libya	95
Madagascar	48.1
Malawi	109.4

Mali	57
Mauritania	142.5
Mauritius	69.3
Morocco	64.4
Mozambique	83.8
Namibia	93
Niger	49.3
Nigeria	30.5
Rwanda	39.9
Sao Tome and Principe	54.1
Senegal	63.3
Seychelles	115.1
Sierra Leone	89.4
South Africa	63.4
Sudan	25.5
Swaziland	97.9
Tanzania	51.7
Togo	84.1
Tunisia	87.9
Uganda	38.3
Zambia	77.4
Zimbabwe	57.9

- **FDI balance per capita in US dollars in 2013 (World Bank)**

Country	FDI	FDI per capita
Algeria	1.69e+09	4.31e+07
Angola	-7.12e+09	-3.31e+08
Benin	3.20e+08	3.11e+07
Botswana	1.89e+08	9.43e+07
Burkina Faso	3.74e+08	2.21e+07
Burundi	6884807	674981.1
Cameroon	5.72e+08	2.56e+07
Central African Republic	800000	173913
Chad	5.38e+08	4.21e+07
Comoros	1.39e+07	1.99e+07
Côte d'Ivoire	3.71e+08	1.83e+07
DR Congo	1.70e+09	2.51e+07
Egypt	5.55e+09	6.76e+07
Equatorial Guinea	1.91e+09	2.39e+09
Eritrea	4.39e+07	6961746
Ethiopia	9.53e+08	1.01e+07
Gabon	8.56e+08	5.04e+08
Gambia	2.53e+07	1.40e+07
Ghana	3.23e+09	1.25e+08
Guinea	1.35e+08	1.16e+07
Guinea-Bissau	1.45e+07	8530507

Kenya	5.14e+08	1.16e+07
Lesotho	4.49e+07	2.14e+07
Libya	7.02e+08	1.13e+08
Madagascar	8.38e+08	3.66e+07
Malawi	1.18e+08	7221823
Mali	4.10e+08	2.68e+07
Mauritania	1.13e+09	2.89e+08
Mauritius	2.59e+08	1.99e+08
Morocco	3.36e+09	1.02e+08
Mozambique	6.70e+09	2.60e+08
Namibia	9.04e+08	3.93e+08
Niger	6.31e+08	3.55e+07
Nigeria	5.61e+09	3.23e+07
Rwanda	1.11e+08	9388176
Sao Tome and Principe	1.06e+07	5.30e+07
Senegal	2.98e+08	2.12e+07
Seychelles	1.78e+08	1.78e+09
Sierra Leone	1.44e+08	2.36e+07
South Africa	8.12e+09	1.53e+08
Sudan	2.18e+09	5.73e+07
Swaziland	2.42e+07	2.02e+07
Tanzania	1.87e+09	3.80e+07
Togo	8.42e+07	1.24e+07
Tunisia	1.06e+09	9.71e+07

Uganda	1.19e+09	3.18e+07
Zambia	1.81e+09	1.25e+08
Zimbabwe	4.00e+08	2.84e+07

- **Electrification rate in 2013 (World Energy Outlook)**

Country	Share of Population with access to electricity (%)
Algeria	99
Angola	30
Benin	28
Botswana	66
Burkina Faso	16
Burundi	10
Cameroon	54
Central African Republic	3
Chad	4
Comoros	45
Côte d'Ivoire	26
DR Congo	9
Egypt	100
Equatorial Guinea	66
Eritrea	32
Ethiopia	23

Gabon	60
Gambia	35
Ghana	72
Guinea	12
Guinea-Bissau	20
Kenya	20
Lesotho	28
Libya	100
Madagascar	15
Malawi	9
Mali	27
Mauritania	21
Mauritius	100
Morocco	99
Mozambique	39
Namibia	30
Niger	14
Nigeria	45
Rwanda	17
Sao Tome and Principe	59
Senegal	55
Seychelles	97
Sierra Leone	5
South Africa	85

Sudan	35
Swaziland	27
Tanzania	24
Togo	27
Tunisia	100
Uganda	15
Zambia	26
Zimbabwe	40

STATA Outputs

- **Simple Linear Regression Model:**

Source	SS	df	MS	Number of obs =	48
				F(1, 46) =	6.10
Model	7.4050292	1	7.4050292	Prob > F =	0.0173
Residual	55.8863952	46	1.21492164	R-squared =	0.1170
				Adj R-squared =	0.0978
Total	63.2914244	47	1.34662605	Root MSE =	1.1022

loggdppc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
coinst	.6855355	.2776775	2.47	0.017	.1265997	1.244471
_cons	7.7428	.2444582	31.67	0.000	7.250731	8.234868

- **Multiple Linear Regression Model:**

Source	SS	df	MS	Number of obs =	48
				F(8, 39) =	16.67
Model	48.9696637	8	6.12120796	Prob > F =	0.0000
Residual	14.3217607	39	.367224634	R-squared =	0.7737
				Adj R-squared =	0.7273
Total	63.2914244	47	1.34662605	Root MSE =	.60599

loggdppc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
coinst	.441865	.2360089	1.87	0.069	-.035508	.919238
lang	.0009421	.0044497	0.21	0.833	-.0080583	.0099425
lit	.0126172	.0063996	1.97	0.056	-.0003272	.0255617
sea	.1297166	.2331072	0.56	0.581	-.3417871	.6012204
res	.0225724	.0083346	2.71	0.010	.0057141	.0394308
trade	.0014291	.0041923	0.34	0.735	-.0070507	.0099089
fdipc	4.76e-10	2.56e-10	1.86	0.070	-4.08e-11	9.93e-10
elec	.0185636	.0042816	4.34	0.000	.0099033	.027224
_cons	5.342631	.4674	11.43	0.000	4.397225	6.288037

Summary of significance (with 10% as the highest acceptable level):

Variable	Significance	Level
Coinst	Yes	10%
Lang	No	-
Lit	Yes	10%
Sea	No	-
Res	Yes	1%
Trade	No	-
Fdipc	Yes	10%
Elec	Yes	1%

- **Restricted model (lang, lit)**

Source	SS	df	MS		
Model	47.2257576	6	7.8709596	Number of obs	= 48
Residual	16.0656668	41	.391845532	F(6, 41)	= 20.09
				Prob > F	= 0.0000
				R-squared	= 0.7462
				Adj R-squared	= 0.7090
Total	63.2914244	47	1.34662605	Root MSE	= .62598

loggdppc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
coinst	.3900002	.2282314	1.71	0.095	-.0709225	.8509229
sea	.0220202	.222773	0.10	0.922	-.427879	.4719194
res	.0211542	.0083494	2.53	0.015	.0042923	.0380161
trade	.0030329	.0041604	0.73	0.470	-.0053692	.0114351
fdipc	5.64e-10	2.61e-10	2.17	0.036	3.82e-11	1.09e-09
elec	.0233326	.0037371	6.24	0.000	.0157854	.0308798
_cons	5.968676	.3791322	15.74	0.000	5.203003	6.734349

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